REMARKS/ARGUMENTS

Claims 1-24 remain in this application. Claims 1-24 stand rejected. Claims 1 and 22 are now amended, without adding any new matter. Claims 25-28 are now cancelled. New claims 29-34 are now added, without adding any new matter.

1. Restriction Of Claims 1-28 Under 35 U.S.C. 121

Claims 1-28 stand subject to a restriction requirement under 35 USC 121 as follows:

Group I – Claims 1 to 24, drawn to a method for forming a channel plate and a method for healing cracks, classified in class 65, subclass 28; and

Group II – Claims 25 to 28, drawn to a switch, classified in class 200, subclass 192.

The Examiner indicated in the Office Action of June 21, 2006 that during a telephone conversation with June Bouscaren on May 9, 2006, a provisional election was made with traverse to prosecute the invention of a method for healing cracks in an abraded substrate, claims 1 through 24, and the Examiner required affirmation of this election.

Applicant hereby affirms the election to prosecute the invention of Group I, drawn to a method for forming a channel plate and a method for healing cracks. Claims 1 to 24 are believed to read on elected invention. In addition, claims 25-28 are now cancelled.

Applicant expressly reserves the right to prosecute unelected subject matter in related patent applications.

2. Objections to the Specification

The disclosure stands objected to because reference character "102" has been used to designated both "The one or more channels" (page 10, paragraph [0033]) and "the substrate" (page 10, paragraph [0033]) in the description of FIG. 11.

Applicant has now amended paragraph [0033] to replace "1102-1100" with --1104-1108-- so as to identify the channels with the correct reference numerals. Applicant has now amended paragraphs [0032] and [0033] to replace each instance of the reference numeral "1100" identifying the channel plate with --800--.

All of the above amendments to the specification are believed to be clerical in nature, and none are believed to add new matter.

3. Rejection of Claims 1, 2, 4, 5, 7, 14-16, 20, 22 and 23 Under 35 USC 102(b)

Claims 1, 2, 4, 5, 7, 14-16, 20, 22 and 23 stand rejected under 35 USC 102(b) as being anticipated by Case, J. Mater. Sci. 32 (1997) 3163-3175; hereinafter "Case (1997)". Applicant has now amended independent claims 1 and 22.

Claim 1

Claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

Case (1997) discloses an experimental procedure for *in situ* environmental scanning electron microscopy studies of semi-macro indent cracks in borosilicate glass that indicate that crack healing occurred at temperatures as low as about 400°C. Case (1997) further discloses that "[t]he crack morphology changes observed

in situ include show crack regression (at low temperatures) and multiple crack pinch-off (at higher temperatures).

Case (1997) does not disclose a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Case (1997) in fact teaches away from the present invention as claimed inasmuch as Case (1997) discloses the use of a Vickers indent with a load to create surface cracks extending away from the Vickers indentation in the glass. Accordingly, amended claim 1 is believed to be allowable.

Claim 14

Claim 14 includes the limitations of independent claim 1, and further recites that the substrate is heated to a temperature that heals micro cracks in the substrate while minimizing sagging of the substrate. Applicant asserts that Case (1997) does not disclose heating the glass to a temperature that heals ***micro cracks*** while minimizing sagging. Accordingly, claim 14 is believed to be allowable for the same reasons as claim 1, and further in view of this limitation.

Claim 15

Claim 15 includes the limitations of independent claim 1, and further recites that the substrate is heated to a temperature that smoothes the surface of the substrate without disturbing macro features of the substrate. Applicant asserts that Case (1997) does not disclose heating the glass to a temperature that heals ***smoothes the surface of the substrate*** without disturbing macro features (such as the Vickers indent). Furthermore, the cracks and the Vickers indent appear to be of similar size such that both should reasonably interpreted as "semi-macro" features. Accordingly, claim 15 is believed to be allowable for the same reasons as claim 1, and further in view of this limitation.

Claims 2, 4, 5, 7, 16 and 20

Claims 2, 4, 5, 7, 16 and 20 each depend directly from independent claim 1 and are believed to be allowable for at least the above-identified reasons.

Claim 22

Claim 22 as originally filed calls for a method for healing cracks in a switch substrate, comprising heating the switch substrate to a temperature in the range between an annealing point and a softening point of the substrate; ***maintaining the temperature for a period of time selected to heal micro cracks formed in at least one channel of the switch substrate***; and cooling the substrate.

Case (1997) discloses crack healing of semi-macro indent cracks formed in the surface of the glass extending away from the Vickers indentation. Case (1997) in fact teaches away from the present invention as claimed inasmuch as Case (1997) discloses healing "semi-macro cracks" rather than micro cracks, and healing cracks formed on the surface of the glass extending away from the Vickers indentation rather than formed in a channel of the substrate. Accordingly, amended claim 22 is believed to be allowable.

Claim 23

Claim 23 depends directly from independent claim 22, and is believed to be allowable for at least the above-identified reasons.

4. Rejection of Claim 6 Under 35 USC 102(b)

Claim 6 stands rejected under 35 USC 102(b) as being clearly anticipated by Tarr, J. Biomed mater Res (Appl Biomater) 48:791-796, 1999; hereinafter "Tarr (1999)".

As discussed above, claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

Tarr (1999) discloses indenting a machinable dental ceramic block with a Vickers indent to produce crack lengths on the surface of the block. The cracks are then measured prior to heating the block. Tarr (1999) in fact teaches away from the present invention as claimed inasmuch as Tarr (1999) discloses the use of a Vickers indent with a load to create surface cracks extending away from the Vickers indentation in the ceramic block.

Neither Case (1997) nor Tarr (1999) teach or suggest a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Accordingly, claim 6, which depends directly from independent claim 1, is believed to be allowable for at least the above-identified reasons.

5. Rejection of Claims 3 and 24 Under 35 USC 103(a)

Claims 3 and 24 stand rejected under 35 USC 103(a) as being unpatentable over Case (1997) as applied in Section 3 above to claims 1 and 2, and claims 22 and 23, respectively, and further in view of Case, J. Mater. Sci. 34 (1999) 247-250; hereinafter "Case (1999)".

Claim 3

As discussed above, claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate. Claim 3, which depends from claim 1, further includes the limitation of

Case (1999) discloses discloses an experimental procedure for *in situ* environmental scanning electron microscopy studies of semi-macro indent cracks in soda-lime silica glass specimens. Case (1999) does not disclose a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Case (1999) in fact teaches away from the present invention as claimed inasmuch as Case (1999) discloses the use of a Vickers indent with a load to create surface cracks extending away from the Vickers indentation in the glass.

Neither Case (1997) nor Case (1999) teach or suggest a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Claim 3, which depends ultimately from independent claim 1, is believed to be allowable for at least the above-identified reasons.

Claim 22

As discussed above, claim 22 as originally filed calls for a method for healing cracks in a switch substrate, comprising heating the switch substrate to a temperature in the range between an annealing point and a softening point of the substrate; ***maintaining the temperature for a period of time selected to heal micro cracks formed in at least one channel of the switch substrate***; and cooling the substrate.

Case (1999) discloses crack healing of indent cracks formed in the surface of the glass extending away from the Vickers indentation. Case (1999) in fact teaches

away from the present invention as claimed inasmuch as Case (1999) discloses healing cracks formed on the surface of the glass extending away from the Vickers indentation rather than formed in a channel of the substrate.

Neither Case (1997) nor Case (1999) teach or suggest a method for healing cracks in a switch substrate, including maintaining a temperature for a period of time selected to heal micro cracks formed in at least one channel of the switch substrate. Claim 24, which depends ultimately from independent claim 22, is believed to be allowable for at least the above-identified reasons.

6. Rejection of Claims 8-10 Under 35 USC 103(a)

Claims 8-10 stand rejected under 35 USC 103(a) as being unpatentable over Case (1997) as applied in Section 3 above to claims 1 and 7, and further in view of the materials information sheet for Corning 1737 AMLCD Glass Substrate data sheet; hereinafter "Materials Information Sheet (1737)".

As discussed above, claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

Materials Information Sheet (1737) discloses information concerning Corning® 1737 AMLCD Glass Substrates. Materials Information Sheet (1737) discloses an annealing point of 721°C (not 172°C as indicated by the Examiner on page 11 of the Office Action of June 21, 2006.)

Neither Case (1997) nor Materials Information Sheet (1737) teach or suggest a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Accordingly, claims 8-10, which depend ultimately from independent claim 1, are believed to be allowable for at least the above-identified reasons.

7. Rejection of Claims 3 and 24 Under 35 USC 103(a)

Claims 11-13 stand rejected under 35 USC 103(a) as being unpatentable over Case (1997) as applied in Section 3 above to claims 1 and 7, and further in view of Corning Materials Information sheet for Pyrex 7740 Borosilicate Glass; hereinafter "Materials Information Sheet (7740)".

As discussed above, claim 1 as originally filed calls for as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

Materials Information Sheet (7740) discloses information concerning Pyrex® 7740 Borosilicate Glass 707 Lithia Potash Borosilicate.

Neither Case (1997) nor Materials Information Sheet (7740) teach or suggest a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Accordingly, claims 11-13, which depend ultimately from independent claim 1, are believed to be allowable for at least the above-identified reasons.

8. Rejection of Claim 17 Under 35 USC 103(a)

Claim 17 stands rejected under 35 USC 103(a) as being unpatentable over Case (1997) in view of Danilatos, Micors Res and Tech 25:354-361 (1993); hereinafter "Danilatos (1993)".

As discussed above, claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

Danilatos (1993) discloses a description of the use of environmental scanning electron microscopy. The Examiner indicates "given that the pictures displayed in Case (1997) (see specifically Figs 1, 2, 7, and 8) are all plan views of the substrate and channel surface, and that the substrate was heated in the ESEM chamber as outlined in the various experimental trials alpha through gamma (see §3.1, pg 3165), and the electron gun is oriented normal to the surface by Danilatos (1993), the substrate must have been oriented with the "at least one channel" facing towards the electron gun when heated." However, Applicants note that Case (1997) does not provide any specific teaching or motivation to conduct their experiment as discussed by the Examiner.

Neither Case (1997) nor Danilatos (1993) teach or suggest a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Accordingly, claim 17, which depends directly from independent claim 1, is believed to be allowable for at least the above-identified reasons.

9. Rejection of Claim 18 Under 35 USC 103(a)

Claim 18 stands rejected under 35 USC 103(a) as being unpatentable over Case (1997) in view of Danilatos (1993) as applied in Section 8 above to claim 17, and further in view of Zworykin, ASTM Bull 117, 15-23 (1942a); hereinafter "Zworykin (1942)".

Applicant notes that a copy of Zworykin (1942) was not provided with the Office Action of June 21, 2006. Furthermore, Zworykin (1942) was not included on the Notice of References Cited (Form PTO-892). Accordingly, the only reference available to Applicant is the copy of Fig. 7 reproduced by the Examiner on page 19 of the Office Action of June 21, 2006. Applicants request a copy of this reference, and that this reference be made of record in a Notice of References Cited (Form PTO-892).

As discussed above, claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

Fig. 7 of Zworykin (1942) appears to disclose a scanning electron microscope with a electron source provided below the specimen. However, Applicants note that Case (1997) does not provide any specific teaching or motivation to conduct their experiment as discussed by the Examiner.

Neither Case (1997) nor Fig. 7 of Zworykin (1942) teach or suggest a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***. Accordingly, claim 18, which depends ultimately from independent claim 1, is believed to be allowable for at least the above-identified reasons.

10. Rejection of Claims 18 Under 35 USC 103(a)

Claim 18 stands rejected under 35 USC 103(a) as being unpatentable over Case (1997) as applied to claim 1 above, and further in view of Michigan State University SEM Sample Holder Instruction Sheet; hereinafter "MSU (2003)". Applicant notes that claim 19 has not been addressed by the Examiner in the Office Action of June 21, 2006. Applicant believes that the Examiner identified erroneously claim 18 instead of claim 19 for this rejection. Applicant respectfully requests specific clarification with respect to this rejection.

As discussed above, claim 1 as currently amended calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; and cooling the substrate.

MSU (2003) discloses a sample holder for holding a sample in a scanning electron microscope.

Neither Case (1997) nor MSU (2003) teach or suggest a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate. Accordingly, claim 18 (and claim 19), which depends ultimately from independent claim 1, is believed to be allowable for at least the above-identified reasons.

11. New Claims

Applicant has now added new claims 29-35, which are believed to be allowable for at least the following reasons.

New Claim 29

New claim 29 includes the limitations of claims 1 and 8, and further includes the limitation that the substrate is heated to a temperature in the range of about 890°C to 975°C. As disclosed in the original application on page 5, lines 4-6, a maximum temperature in the range between the annealing point and the softening point of the substrate is preferred. The claimed range of about 890°C to 975°C is generally an upper third of the range between the annealing point and the softening point of a Corning®1737 Glass substrate.

The prior art of record, including Case (1997), does not disclose or suggest heating the substrate to a temperature in the range of about 890°C to 975°C, which is close to the softening point of the Corning® 1737 Glass substrate. Accordingly, for these reasons and the reasons identified above with respect to claims 1 and 8, new claim 28 is believed to be allowable.

New Claim 30

New claim 30 includes the limitations of claims 1 and 11, and further includes the limitation that the substrate is heated to a temperature in the range of about 734°C to 821°C. As disclosed in the original application on page 5, lines 4-6, a maximum temperature in the range between the annealing point and the softening point of the substrate is preferred. The claimed range of about 734°C to 821°C is generally an upper third of the range between the annealing point and the softening point of a Pyrex® Brand 7740 Glass substrate.

The prior art of record, including Case (1997), does not disclose or suggest heating the substrate to a temperature in the range of about 890°C to 975°C, which is close to the softening point of the Pyrex® Brand 7740 Glass substrate. Accordingly, new claim 29 is believed to be allowable.

New Claim 31

New claim 31 calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate, which in turn forms micro cracks in the at least one channel during the abrading the at least one channel in the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; ***maintaining the temperature for a period of time selected to heal the micro cracks formed in the at least one channel***; and cooling the substrate. As disclosed on page 5, lines 13-15, "the glass is heated to the point where it becomes slightly liquid and to maintain the temperature at that point for an adequate period of time so that the micro cracks are healed and the surface roughness is smoothed."

The prior art of record does not disclose a method for forming a channel plate, including abrading at least one channel in a substrate, which in turn forms micro cracks in the at least one channel during the abrading the at least one channel in the substrate, or including maintaining the temperature for a period of time selected to heal the micro cracks formed in the at least one channel; and cooling the substrate.

New Claim 32

New claim 32 depends directly from new claim 31, and further includes the limitation that the maximum crack length is shorter than the maximum channel depth. This limitation is clearly supported by the application as filed, for example, in FIGS. 5-7.

New Claim 33

New claim 33 depends directly from claim 31, and further calls for the abrading the at least one channel in the substrate roughens a surface in the at least one channel. Claim 33 also includes the limitation of maintaining the temperature for a period of time selected to smooth the surface roughened in the at least one channel.

For example, the application as filed indicates on page 4, lines 11-12, that "the surface of the cannel 500 may be roughed due to the abrading." The application further states at page 5, lines 13-15, "the glass is heated to the point where it becomes slightly liquid and to maintain the temperature at that point for an adequate period of time so that the micro cracks are healed and the surface roughness is smoothed."

New Claim 34

New claim 34 calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; ***maintaining the temperature for a period of time selected to heal micro cracks in a surface of the at least one channel without distorting an overall geometry of the substrate; and cooling the substrate***. The application as filed indicates at page 4, lines 10-11, that "during abrading 102, micro cracks 502 are formed in the channel 500 of the substrate 200

as shown in FIGS. 5 and 6." The application as filed also discloses on page 5, lines 6-9, that "[t]his temperature is maintained for a period of time as will be described in greater detail below such that the micro cracks in...the channel 500 are healed by having the walls fuse together..."

The prior art does not disclose a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate, or including maintaining the temperature for a period of time selected to heal micro cracks in a surface of the at least one channel without distorting an overall geometry of the substrate.

New Claim 35

New claim 35 calls for a method for forming a channel plate, comprising ***abrading at least one channel in a substrate by ejecting particles toward the substrate***; heating the substrate to a temperature in the range between an annealing point and a softening point of the substrate; ***maintaining the temperature for a period of time selected to smooth the surface of the at least one channel in the substrate without distorting an overall geometry of the substrate***; and cooling the substrate. As discussed above, the application as filed indicates at page 4, lines 10-11, that "during abrading 102, micro cracks 502 are formed in the channel 500 of the substrate 200 as shown in FIGS. 5 and 6." The application as filed also discloses on page 5, lines 6-9, that "[t]his temperature is maintained for a period of time as will be described in greater detail below such that...the surface roughness of the substrate 200 is smoothed without significantly distorting the larger geometries of the substrate 200."

The prior art of record does not disclose a method for forming a channel plate, including abrading at least one channel in a substrate by ejecting particles toward the substrate, or maintaining the temperature for a period of time selected to smooth the surface of the at least one channel in the substrate without distorting an overall geometry of the substrate.

Conclusion

In light of the above remarks, Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,
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